

time would be in great activity. But in such genera as *Scarites* and *Morio*, and the innumerable allies of both, which copulate in burrows or under bark, that is in confined recesses from which the female cannot well escape, we see nothing but simple unmodified tarsi.

On these data it seems right to say that the males of *Doubledaya* have tarsi developed on the combined principle of *Carabus* and *Chrysomela*, and that this development is caused by the combination of those influences which act separately in the two last-named genera.

## DESCRIPTION OF PLATE XIV.

- Fig. 1. *Doubledaya bucculenta*, Lewis, male.  
 2. — — —, female.  
 3. — — —, male, head, magnified.  
 4. *Languria ingens*, Lewis, male.  
 5. — — —, male, middle tibia, magnified.  
 6. — — — *pectoralis*, C. Waterhouse, male.  
 7. — — — *Lewisii*, Crotch, male.  
 8. — — —, male, fore femur, magnified.  
 9. — — — *columella*, Lewis.  
 10. — — — *ruficeps*, Crotch.  
 11. — — —, antenna, magnified.  
 12. — — — *fucosa*, Lewis.  
 13. — — —, antenna, magnified.

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On the Replacement of a true Theca or Wall by Epitheca in some Serial Coralla, and on the Importance of the Structure in the Growth of Incrusting Corals. By Prof. P. MARTIN DUNCAN, F.R.S., Vice-Pres. Linn. Soc.

[Read November 15, 1883.]

DURING the discussions regarding the physiological value of some of the structures of Madreporaria, great discrepancies have been noticed in the opinions of naturalists. Amongst the structures which have been carefully considered, no one has been more debated than the epitheca. It has been pronounced to be worthless in generic diagnosis on account of its not being of primary

physiological importance, and not to be of very satisfactory specific value on account of one well-known form having varieties with and without this basal structure. It has been a perplexing structure where it has been found so closely united to a wall of a simple corallum as to render it impossible to determine whether there is a wall at all, and whether the structure is not epithecate entirely. Even in the days when the 'Hist. Nat. des Corall.' was written, the secondary importance of the epitheca in classification was evidently in the thoughts of Milne-Edwards and Jules Haime; and they decided, without the proper examination, that in many instances where there was an epitheca on the base of a compound Aporose coral, it must cover a common plateau or wall.

Really it appears that epitheca may be a simply protective structure covering costæ and the wall, and in the majority of such instances preserving the coral from the attacks of parasites; and that it may also be of great physiological importance, replacing the solid basal theca or wall in compound or colonial coralla, and forming the foundation structure in others, whence the corallites arise and grow upwards.

I have chosen two examples of the importance of epitheca as a fundamental basal structure. A species of *Cœloria* has no true basal wall, but there is a mural epitheca. The mural deficiencies of the species are also noticed between the series. A species of *Leptoria* has also an epithecate basal wall. There is also an example in a species of *Porites* of the method of growth of expanded forms with wide bases, from the upper surface of an epitheca.

These instances, which are types of many others, indicate that it is not reasonable to deny the classificatory value of the epitheca entirely, and that it is of primary importance in many genera.

A species of *Porites* and of *Leptastræa* explain the importance of the basal epitheca on the growth of incrusting corals.

The importance of the epitheca is evident in *Cœloria labyrinthica*, variety *pachychila*, Ehrenberg. This species has been called *Cœloria Forskælana* by Milne-Edwards and Jules Haime; and it is well described in their Hist. Nat. des Corall. vol. ii. p. 414. They only examined horizontal sections; and they therefore missed the view of the curious internal construction of the coral and the nature of the basal structures.

In the generic diagnosis of *Cœloria*, Milne-Edwards and Jules Haime noticed that the corallum is massive and cellular, very

largely fixed by its base, the common plateau being covered with a thin but complete epitheca. The columella is parietal and reduced to a few trabeculæ derived from the inner edge of the septa. In the specific diagnosis they state that the horizontal section shows no columella, and that the union of the corallites is by thin and linear walls.

It is best to examine the walls between the serial corallites first, and then to proceed to the examination of the basal structure. A vertical fracture indicates that there is no true wall between the serial corallites, and the septa are very exsert, standing up far above what, from its position, seems to be the top of a wall. Really this top is the upper surface of a nodule, circular in vertical fracture, which extends from one septum to another in the place of a wall. It is the top nodule of a vertical series standing out from the flanks of opposed septa; and one nodule is separated from those above and below it by some space, where there is no trace of intercorallite wall. This space is occupied by arched dissepiments; so that instead of a solid continuous vertical wall between neighbouring corallites (series), there is a vertical series of nodular processes with endotheca filling up the spaces between them. It is this endotheca which prevents one visceral cavity communicating with those on either side as in the *Perforata*.

The columella is formed of stout processes from the septal ends, and besides by a growth which commences at the base; it is therefore partly parietal and partly essential, and is always trabeculate.

On examining the base of the corallum, no true theca is found, so the "plateau commun" appears to be a mythical structure. There is a stout epitheca inseparable from any thing else; and it occupies the position of the basal wall, and the septa and columella arise from it. It is very thin but strong, is marked with concentric ridges and lines, as is usual to epitheca; and it clearly bounds the interseptal spaces below.

The nodular processes of the interserial or intercorallite wall cannot be mistaken for synapticula; they are in the line of where a wall might be, and are septal structures. They are, however, very remarkable.

This species certainly departs from the generic characters of the *Cœloria*. The well-known mural perforations of *Cœloria dædalæa*, Solander, sp., are close to the margin, and are due to imperfect growth; they in no wise resemble the condition in the

form just described. Provisionally the variety *pachychila* must be separated from the *Cæloriæ*; but until further researches are completed, I do not propose to establish a new genus.

LEPTORIA PHRYGIA, *Ellis & Solander, Hist. of Zooph.* pl. 48; *Milne-Edwards & Jules Haime, Hist. Nat. des Corall.* vol. ii. p. 406.

The specific characters of this form were given by Milne-Edwards and Jules Haime; and the specimen under consideration comes within their diagnosis. In the definition of the genus those authors remark:—"Le plateau inférieur est revêtu d'une épithèque mince mais complète." They of course notice that the series of corallites unite with their neighbours by their walls. According to these descriptions, it is implied that whilst each individual is soldered by its flanks to its neighbours, the whole colony or corallum rests on a common plateau clothed with an epitheca. Presumably there is a theca or basal wall from which the calicular or, rather, serial walls arise.

An examination reveals a different state of things; for on removing the epitheca, which is thin, opaque, and marked with undulating grooves and linear elevations, no trace of a theca, wall, or plateau can be found.

The epitheca covers a considerable surface, and above it, in the lowest position of the corallum, are the lower ends of septa, the interserial walls, and the lamellar columellæ, and all these are united by dissepiments which give a cellular appearance to the whole. In fact, the epitheca is the only basal structure; there is no plateau like a theca; and the upward growth occurred from the thin opaque structure which covered every thing on the stone upon which the coral grew. The epitheca was not adherent in many places to the foreign body. The ridges between the long and rarely sinuous serial corallites are narrow, and septa cross them from one series to those on either side. In the long axis of each ridge is a slender wall which reaches upwards to within a millimetre of the free denticulate septal edge. The septa project at right angles to the wall on either side of it; and on their vertical edge are stout nodular projections, which are recognized on the upper part of the septum where it joins its fellow over the wall as simple dentations. The nodular projections may be seen to unite with corresponding structures on the sides of the slender lamellar columella. This has a thin and

lobed free upper edge, and it is seen in the axis of the serial corallites.

The endothecal structures are plentiful, but delicate, arched, and thin. One set of dissepiments stretches from one septum to its neighbour on either side in the same serial corallite, and another set is parallel to the flanks of the columella, and extends from it between the nodular points, and comes in contact with the free vertical edge of the septa. The closing of the inferior parts of the interseptal loculi and of the space between the septa and the columella is perfect; and as the coral grows upwards and outwards, there is a succession of floors of arched dissepiments formed. The columella is essential, and arises from the endothecal base, whence spring the walls and septa.

In this instance the epitheca clearly acts as a base of growth, like the solid theca of some compound corals. Its structure resembles that of the protective epitheca which is seen covering the walls of many simple corals; but it is denser within, and yet is very readily removed by force.

*PORITES LUTEA*, Quoy & Gaimard, *Voy. de l'Astrolabe*, Zooph. 1833, p. 249.

This species is one of the incrusting forms of *Porites*, or, rather, it has a well-developed epitheca on its large base which covers the substances on which the coral rests, and to which it adheres more or less.

It is a low form; and the specimen under consideration is 4 inches long, 2 inches broad, and 1 inch high in the centre. The edges are thin, and the base is concave, so that the coral is an elongated flat dome in shape. The corallites are about  $\frac{3}{4}$  millim. in breadth, and there are therefore a vast number of them in the corallum.

It is perfectly evident that all the corallites could not arise by gemmation from one parent, and that nearly all do arise directly from the base of the corallum.

There is no sclerenchyma made up of a layer of highly trabecular tissue which might act as a base for the corallites to spring from. On the contrary, they arise from the upper surface of the epitheca, which was therefore their basal structure when they commenced growth. Subsequently many did bud on their flanks; but the majority simply grow vertically, or in a slanting direction.

GENUS LEPTASTRÆA, *Milne-Edwards & Jules Haime.*

This is a genus typical of incrusting and solid Aporose Astræidæ, and the species are very well characterized by their thick intercorallite walls and intercorallite tissue. In a species from Mergui many scores of corallites of 5 or 6 millim. in height covered the uneven surface of a piece of conglomerate; and it is evident that although extracalicular gemmation occurs in a few instances, the majority of the corallites grew side by side from a basal structure, and usually upwards in a vertical line. The base is not a wall, but a very thin epitheca; and there is no true wall.

There is no doubt that this epithecal replacement is very common in the incrusting species of most genera; and the peculiar increase of the corallum is at first by growth from the common epithecate basal expansion and then by gemmation from the wall of the corallite.

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On the Auditory Ossicles of *Rhytina Stelleri*. By ALBAN DORAN, F.R.C.S. (Communicated by Professor W. H. FLOWER, F.R.S., F.L.S.)

[Read December 20, 1883.]

IN a recent monograph contributed to this Society and published in its Transactions\*, I described the characters of the auditory ossicles of the Mammalia, having succeeded in procuring for the purposes of description and study a very large series of these little bones, which now constitute a special collection, preserved in the Museum of the Royal College of Surgeons of England. It was only with regard to a very few species indeed that I was compelled to rely upon descriptions found in the works of comparative anatomists; for where the vast resources of the College, kindly placed at my disposal by Professor Flower, failed to enlighten me, I generally succeeded in borrowing the desired ossicles from other collections. In describing the ear-bones of the Sirenia, however, I had to rely entirely on description in the case of *Rhytina*, my source of information being a paper by Claudius entitled "Das Gehörorgan von *Rhytina Stelleri*," published in the 'Mémoires de l'Académie des Sciences de St. Pétersbourg,' 1867. Claudius describes the malleus very clearly; but ever since the publication of my own monograph, I have been seeking an oppor-

\* "Morphology of the Mammalian Ossicula auditus," Linn. Soc. Trans. 2nd ser. Zoology, vol. i. pp. 371-497, pls. 58-64.